CLAIMS

For the convenience of the Examiner, all claims have been presented whether or not an amendment has been made.

1.   **(Currently Amended)** A method of storing data in a database, comprising:

obtaining ~~both~~ a **first** raw ~~form of a~~ data **value** ~~to be stored~~**;**

generating ~~and~~ a **first** syntax-normalized ~~form of said~~ data **value associated with the first raw data value**;

~~assigning at least one attribute identifier and at least one entry identifier to said data;~~

storing concurrently in a first table and a second table ~~the at least one entry identifier and~~ both the **first** syntax-normalized **data value** ~~form~~ and the **first** raw ~~form of said~~ data **value**; ~~and~~

~~storing the at least one attribute identifier in an attribute table.~~

receiving a query associated with an object and with the first syntax-normalized data value, wherein:

the object is associated with a first entry identifier; and

the first syntax-normalized data value is associated with an attribute identifier;

retrieving from the first table a plurality of entry identifiers, wherein each of the plurality of entry identifiers is associated, in the first table, with a parent entry identifier that matches the first entry identifier; and

for each of the retrieved entry identifiers:

identifying in the second table an entry associated with the respective retrieved entry identifier, wherein the entry is associated with the attribute identifier and comprises a respective syntax-normalized data value and a respective raw data value; and

if the respective syntax-normalized data value matches the first syntax-normalized data value, retrieving the respective raw data value.

2.   (Currently Amended) A method of storing data in a database, as claimed in claim 1, wherein ~~said obtaining comprises:~~

~~first obtaining a raw form of a data and thereafter generating~~ said **first** syntax-normalized **data value is generated** ~~form~~ from said **first** raw ~~form of the~~ data **value**.

3.   (Currently Amended) A method of storing data in a database, as claimed in claim 1, wherein said storing comprises:

maintaining both the **first** syntax-normalized ~~form~~ **data value** and the **first** raw **data value** ~~form of the data~~ for data base searching and data retrieval.

4.   (Currently Amended) A method of storing data in a database, as claimed in claim 3 wherein said maintaining comprises maintaining said **first** raw **data value** ~~form~~ and **said first** syntax-normalized **data value** ~~form of a data~~ in at least two entry tables.

5.   (Currently Amended) A method of storing data in a database, as claimed in claim 4, wherein said maintaining further comprises correlating the storage location of said

first raw **data value** ~~form~~ and said **first syntax-**normalized ~~form~~ **data value** in said at least two entry tables.

6.   **(Withdrawn)** A method of storing data in a database, as claimed in claim 2, wherein said generating step comprises:

applying directory service attribute syntax rules to the raw data.

7.   **(Withdrawn)** A method of enabling data to be arranged and/or stored in a database used in a directory service system, the method including the steps of:

a.   applying directory service attribute syntaxes rules to the data, and

b.   creating a normalized form of the data.

8.   **(Withdrawn)** A method of enabling data to be arranged and/or stored in a database as claimed in claim 7, further comprising:

c.   storing said data and the normalized form of the data concurrently in at least one table.

9.   **(Withdrawn)** A method of enabling data to be arranged and/or stored in a database as claimed in clam 8, wherein said at least one table comprises a plurality of columns and a plurality of rows, and said storing step comprises storing said data and said normalized form of the data in related locations.

10.   (Withdrawn) A method of enabling data to be arranged and/or stored in a

database as claimed in claim 9, wherein said locations in a table are related by being in a

common row.

11.   (Withdrawn) A method of enabling data to be arranged and/or stored in a

database as claimed in claim 8, wherein said at least one table comprises a HIERARCHY

table and an OBJECT table.

12.   (Currently Amended) A method of locating data in a database, wherein ~~at~~

~~least one attribute identifier is stored in an attribute table and said data is stored in at least two~~

~~entry tables in~~ a **first** raw **data value is stored in** ~~form~~ **a first table and a second table** and

linked to a concurrently stored **first** syntax-normalized ~~form of the~~ data **value**, comprising:

~~locating said raw data by searching on said syntax-normalized form of the data.~~

receiving a query associated with an object and with the first syntax-normalized

data value, wherein:

the object is associated with a first entry identifier; and

the first syntax-normalized data value is associated with an attribute

identifier;

retrieving from the first table a plurality of entry identifiers, wherein each of the

plurality of entry identifiers is associated, in the first table, with a parent entry

identifier that matches the first entry identifier; and

for each of the retrieved entry identifiers:

identifying in the second table an entry associated with the respective retrieved entry identifier, wherein the entry is associated with the attribute identifier and comprises a respective syntax-normalized data value and a respective raw data value; and

if the respective syntax-normalized data value matches the first syntax-normalized data value, retrieving the respective raw data value.

13.   (Withdrawn) A method of locating data in a database, as claimed in claim 12, wherein said searching is performed using SQL.

14.   (Withdrawn) A method of locating data in a database, as claimed in claim 12, wherein said searching is performed on an OBJECT table, comprising a plurality of columns and a plurality of rows.

15.   **(Withdrawn)** A method of locating data in a database, as claimed in claim 14, further comprising for a data entry:

specifying an attribute ID (AID), said AID being stored in a first one of said plurality of columns and in a predetermined row;

storing an entry ID (EID), said BID being stored in a second one of said plurality of columns and in said predetermined row;

storing a normalized form of said data entry in a third one of said plurality of claims and in said predetermined row.

16.   **(Withdrawn)** A method of formatting a find request for a database having stored therein objects including attributes each having a type and value(s), the method including:

a.   creating a database representation of the type (AID); and

b.   creating a database representation of the value(s) (NORM).

17.   **(Withdrawn)** A method as claimed in claim 16, wherein step a. is performed by looking up an ATTRIBUTE table.

18.   **(Withdrawn)** A method as claimed in claim 16, wherein step b. is performed by applying syntax normalization.

19.   **(Withdrawn)** A method of locating objects stored in a database, the method comprising the step of applying AID and NORM to determine a matching object (BID), wherein the method of claim 16 is used to determine AID and / or NORM

20.   **(Withdrawn)** A method of locating objects stored in a database, the method comprising the step of applying AID and NORM to determine a matching object (EID), wherein the method of claim 17 is used to determine AID and / or NORM

21.   **(Withdrawn)** A method of locating objects stored in a database, the method comprising the step of applying AID and NORM to determine a matching object (EID), wherein the method of claim 18 is used to determine AID and / or NORM

22.   **(Withdrawn)** A method of locating objects stored in a database, the method comprising the step of applying AID and NORM to determine a matching object (EID).

23.   **(Withdrawn)** A method as claimed in claim 22 wherein the step of applying is performed using SQL.

24.   **(Withdrawn)** A method of retrieving contents of object(s) from a database, the method including the step of:

a.   finding row(s) which match a predetermined EID(s).

25.   **(Withdrawn)** A method as claimed in claim 24, further including the step of:

b.   returning from the row(s), EID, AID and a raw form.

26.   **(Withdrawn)** A method as claimed in claim 25, further including the step of:

c.   converting the result of step b. into objects containing attribute(s), each attribute having a type and value(s).

27.   **(Withdrawn)** A method of providing data as an output from a database, the "output being in response to a directory service/query, the method comprising the steps of:

processing said directory service/query to identify said data in the database; and

providing as the output, a raw form of the data.

28.   **(Withdrawn)** A method of providing data as an output from a database, as claimed in claim 27, wherein said processing step is based on other than said raw data.

29.   **(Withdrawn)** A method of providing data as an output from a database, as claimed in claim 28, wherein said processing step comprises a comparison of data directly corresponding to said raw data but in normalized form.

30.   **(Withdrawn)** In a directory service system, having a database in which data is stored in a first form; and a second form, being a normalized form, a method of transferring data into and out of the database, the method including the steps of:

finding data in the database using a normalized form; and transferring data out of the database using a raw form.

31.   **(Currently Amended)** A database apparatus comprising:

means for obtaining ~~both~~ a **first** raw ~~form of a~~ data **value** ~~to be stored~~**;**

means for generating ~~and~~ a **first** syntax-normalized ~~form of said~~ data **value**

associated with the first raw data value;

~~means for assigning at least one attribute identifier and at least one entry identifier to~~

~~said data; and~~

a storage medium operable to ~~:~~ store concurrently in a first table and a second table

~~the at least one entry identifier and~~ both the **first** syntax-normalized **data value** ~~form~~ and the

first raw ~~form of said~~ data **value**; ~~and~~

~~store in an attribute table the at least one attribute identifier.~~

means for receiving a query associated with an object and with the first syntax-

normalized data value, wherein:

the object is associated with a first entry identifier; and

the first syntax-normalized data value is associated with an attribute

identifier;

means for retrieving from the first table a plurality of entry identifiers, wherein

each of the plurality of entry identifiers is associated, in the first table, with a parent

entry identifier that matches the first entry identifier; and

means for searching data, wherein the search comprises, for each of the retrieved

entry identifiers:

identifying in the second table an entry associated with the respective

retrieved entry identifier, wherein the entry is associated with the attribute

identifier and comprises a respective syntax-normalized data value and a respective raw data value; and

if the respective syntax-normalized data value matches the first syntax-normalized data value, retrieving the respective raw data value.

32.   (Currently Amended) A database apparatus for storing data in a database, as claimed in claim 31, wherein **the first syntax-normalized data value is generated from the first raw data value.** ~~said means for obtaining comprises:~~

~~means for first obtaining a raw form of a data and thereafter generating said syntax-normalized form from said raw form of the data.~~

33.   (Currently Amended) A database apparatus for storing data in a database, as claimed in claim 31, wherein said storage medium is operative to maintain both the **first** syntax-normalized **data value** ~~form~~ and the **first** raw ~~form of the~~ data **value** for data base searching and data retrieval.

34.   (Currently Amended) A database apparatus for storing data in a database, as claimed in claim 33, wherein said storage medium is operative to maintain said **first** raw **data value** ~~form~~ and **said first** syntax-normalized ~~form of a~~ data **value** in at least two entry tables.

35.   (Currently Amended) A database apparatus for storing data in a database ~~;~~ as claimed in claim 34, wherein said storage locations of said **first** raw **data value** ~~form~~ and

said **first** syntax-normalized ~~form~~ **data value** ~~of data~~ are correlated in said at least two entry tables.

36.   **(Withdrawn)** A database apparatus for storing data in a database, as claimed in claim 32, further comprising:

means for applying directory service attribute syntax rules to the raw data.

37.   **(Withdrawn)** An apparatus for enabling data to be arranged and/or stored in a database used in a directory service system, comprising:

a.   means for applying directory service attribute syntaxes rules to the data;

b.   means for creating a normalized form of the data; and

c.   means for storing said data and the normalized form of the data concurrently in at least one table.

38.   **(Withdrawn)** An apparatus for enabling data to be arranged and/or stored in a database as claimed in claim 37, wherein said at least one table comprises a plurality of claims and a plurality of rows, and said storing step comprises storing said data and said normalized form of the data in related locations.

39.   **(Withdrawn)** An apparatus for enabling data to be arranged and/or stored in a database as claimed in claim 38, wherein said locations in a table are related by being in common row.

40.   (Withdrawn) An apparatus for enabling data to be arranged and/or stored in

a database as claimed in claim 37 wherein said at least one table comprises a HIERARCHY

table and an OBJECT table.

41.   (Currently Amended) An apparatus for locating data in a database, wherein:

~~at least one attribute identifier is stored in an attribute table and said data is stored in~~

~~at least two entry tables in a~~ a first raw **data value is stored in a first table and a second**

table ~~form~~ and linked to a concurrently stored **first** syntax-normalized ~~form of the~~ data

value, the first syntax-normalized data value generated from the first raw data value;

and

comprising:

means for ~~locating said raw form of the data by searching on said syntax-~~

~~normalized form of the data.~~ **receiving a query associated with an object and with**

the first syntax-normalized data value, wherein:

the object is associated with a first entry identifier; and

the first syntax-normalized data value is associated with an

attribute identifier;

means for retrieving from the first table a plurality of entry identifiers,

wherein each of the plurality of entry identifiers is associated, in the first table,

with a parent entry identifier that matches the first entry identifier; and

means for searching data, wherein the search comprises, for each of the

retrieved entry identifiers:

identifying in the second table an entry associated with the respective retrieved entry identifier, wherein the entry is associated with the attribute identifier and comprises a respective syntax-normalized data value and a respective raw data value; and

if the respective syntax-normalized data value matches the first syntax-normalized data value, retrieving the respective raw data value.

42.   (Withdrawn)   An apparatus for locating data in a database, as claimed in claim 41 wherein said searching is performed using SQL.

43.   (Withdrawn)   An apparatus for locating data in a database, as claimed in claim 41, wherein said searching is performed on an OBJECT table, comprising a plurality of claims and a plurality of rows.

44.   (Withdrawn)   An apparatus for formatting a find request for a database having stored therein objects including attributes each having a type and value(s), the apparatus including:

a.   means for creating a database representation of the type (AID), and

b.   means for creating a database representation of the value(s) (NORM).

45.   (Withdrawn)   An apparatus as claimed in claim 4" wherein said means for creating is operative to create a representation by looking up an ATTRIBUTE table.

46.   **(Withdrawn)** An apparatus as claimed in claim 4,5, wherein said means for creating is operative to create the data base representation by a means for applying syntax normalization.

47.   **(Withdrawn)** An apparatus as claimed in claim 44 is operative to determine AID and/or NORM.

48.   **(Withdrawn)** An apparatus as claimed in claim 45 is operative to determine AID and/or NORM.

49.   **(Withdrawn)** An apparatus as claimed in claim 46 is operative to determine AID and/or NORM.

50.   **(Withdrawn)** An apparatus as claimed in claims 46, wherein the means for applying uses SQL.

51.   **(Withdrawn)** An apparatus for locating objects stored in a database, the apparatus comprising means for applying AID and NORM to determine a matching object (EID).

52.   **(Withdrawn)** An apparatus as claimed in claim 51, wherein the means for applying uses SQL.

53.   **(Withdrawn)**   An apparatus for retrieving contents of object(s) from a database, the apparatus comprising:

a.   means for finding row(s) which match a predetermined BID(s).

54.   **(Withdrawn)** An apparatus as claimed in claim 53, further comprising:

b.   means for returning from the row(s), BID, AID and a raw form.

55.   **(Withdrawn)** An apparatus as claimed in claim 54, further comprising:

c.   means for converting the output of the means for returning into objects containing attribute(s), each attribute having a type and value(s).

56.   **(Currently Amended)** In a directory service system, having a database in which a **first** raw ~~form~~ **data value** and ~~a~~ **an associated first** syntax-normalized **data value** ~~form of a data~~ are stored in a first table and a second table ~~and at least one attribute identifier~~ ~~is stored in an attribute table~~, apparatus for transferring data into and out of the database, comprising:

~~means for finding data in the database using a syntax-normalized form; and~~

~~means for transferring data out of the database using a raw form.~~

means receiving a query associated with an object and with the first syntax-normalized data value, wherein:

the object is associated with a first entry identifier; and

the first syntax-normalized data value is associated with an attribute identifier;

means for retrieving from the first table a plurality of entry identifiers, wherein each of the plurality of entry identifiers is associated, in the first table, with a parent entry identifier that matches the first entry identifier; and

means for searching data, wherein the search comprises, for each of the retrieved entry identifiers:

identifying in the second table an entry associated with the respective retrieved entry identifier, wherein the entry is associated with the attribute identifier and comprises a respective syntax-normalized data value and a respective raw data value; and

if the respective syntax-normalized data value matches the first syntax-normalized data value, retrieving the respective raw data value.

57.   **(Previously Presented)**   A computer program product, including a storage medium for storing a computer program, the computer program being executable to perform a method as claimed in any one of claims 1-5.

58.   **(Currently Amended)**   A method as claimed in any one of claims 1-5 wherein the **first** raw ~~form of~~ data **value** is stored in ASN.1 format.

59.   **(Withdrawn)** A directory service system as claimed in anyone of claims 30 and 56 wherein the raw form of data is stored in ASN.1 format.

60.   **(Currently Amended)** An apparatus as claimed in anyone of claims 31-35 and 41 wherein said ~~protocol encoded raw data or~~ **first raw** data **value** is stored in ASN.1 format.

61.   **(Cancelled)**